

REMARKS

Reference sign "216" has been added to Fig. 6 to overcome the first drawing objection at section 1 of the Office Action. At paragraph 0044 of the specification, "228" has been changed to "230". Accordingly, the second drawing objection at section 1 of the Office Action is no longer applicable. Reference sign "262" has been changed to "263" in Fig. 2 (a corresponding change has been made at paragraph 0038 of the specification) to overcome the third drawing objection at section 1 of the Office Action. In Fig. 6, the lead line from reference sign "240" has been corrected to properly identify the lower chamber, and the second "212" has been deleted. Accordingly, the drawing objections at section 2 of the Office Action have been overcome.

Specification paragraphs 0045, 0054, 0055, and 0059 have been amended, as suggested by the Examiner, to overcome the specification objections at section 3 of the Office Action. Claim 8 has been amended to overcome the claim objection at section 4 of the Office Action. Claims 6, and 12, 14 and 15 have been amended to overcome the § 112 rejections at section 5 of the Office Action.

Claims 1-3 have been cancelled with the subject matter of these claims generally combined with additional elements in new claim 18. New claim 19 describes the seal discussed at [0041]. Claims 4-7 have been amended to depend from new claim 18. Claims 9, 11, 13 and 17 have been cancelled, with the subject matter of claim 11 now included in claim 8. Claims 4-8, 10, 12 and 14-19 are pending. Reconsideration and withdrawal of the remaining rejections are requested in view of the following remarks.

The claims are directed to a system for cleaning a workpiece, typically following chemical/mechanical planarization (CMP) processing. In CMP processing, the wafer is ground with a slurry. Both sides of the wafer tend to become contaminated, even if only one side is ground. To remove the slurry residue, post- CMP processing machines often use brushes and a cleaning liquid, with the brushes brushing over or on the wafer surface (or both wafer surfaces). Generally, after this brush cleaning, a rinsing/drying step is performed. See Shinbara et al USP 5,485,644 of record. However, the invention contemplates apparatus suitable for rinsing and drying, and also useful in subsequent cleaning applications (e.g., a safety clean or a pre-litho clean). In these applications, it is advantageous to be able to apply fluids to the back side of the wafer, and to the wafer edge or to a perimeter area only of the front side. The claimed system recognizes this need and the advantages of the combination of a rotating processing chamber or capsule with a post CMP processing machine.

The claimed system includes at least one brush station having brushes, a capsule formed by an upper rotor and a lower rotor (or by upper and lower chamber members), and a robot moveable to transfer the workpiece from the brush station to the capsule or rotating chamber. The combination of using a brush station and a rotating chamber to clean a workpiece provides an exceptionally high level of cleaning. Additionally, because the brush station(s) substantially clean the workpiece before it enters the capsule, and because the capsule includes upper and lower rotors (or chamber members) that generally conform to the workpiece, only small amounts of rinsing and drying fluids are used.

Turning to the § 103 rejections at section 8 of the Office Action, Applicants submit that there is no suggestion to combine the teachings of Shinbara et al. and Curtis et al. to yield the claimed systems. The claimed rinser/dryer capsule assembly is a very efficient cleaning apparatus, as it uses a minimal amounts of rinsing and drying fluid. The processing chamber has a small volume which reduces fluid consumption. Claim 12 describes the chamber as conforming closely to the workpiece to further minimize fluid consumption. The rotating chamber, as described in claims 8 and 18, can also separately clean each side of the workpiece, thus allowing the use of different cleaning fluids on the front and back sides of the workpiece. The front side of the workpiece may have semiconductor devices, while the back side does not. Accordingly, a cleaning or rinsing solution that will not damage the semiconductor devices can be used on the front side of the workpiece, and a more aggressive chemical can be used on the back side of the workpiece, if desired, so that contaminants can be effectively removed without damaging the front side of the workpiece. By first performing brushing at one or more brush stations, followed by rinsing and drying in the claimed rotating processing chamber, good cleaning results can be obtained.

Turning to the prior art, there is no suggestion in Shinbara et al. USP 5,485,644 to use a rotating process chamber. Shinbara et al. uses the open rinsing and drying unit 4 shown in Fig. 16 therein. Shinbara makes no suggestion to use a rotating and closed chamber as claimed. There is also no suggestion in Curtis et al. USP 6,318,385 to use a brush station before loading the workpiece into the rinser/dryer capsule. Indeed, Curtis et al does not mention post-CMP cleaning or brushes.

In view of the foregoing comments and the changes to the claims, Applicant submits that the claims are in condition for allowance. A Notice of Allowance is requested.

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